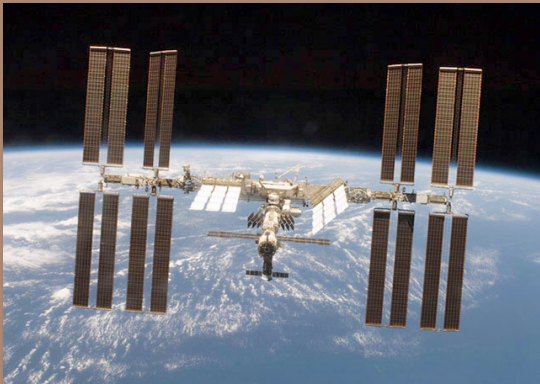


Solar Cell Power History

NASA Glenn developed and deployed stand-alone power systems in remote areas of the world from 1975 to 1985 for DOE (nee ERDA). NASA brought these villages power for grain grinding, water pumping, refrigeration, lighting, and communications.



NASA Glenn installed this photovoltaic power system in the remote African village of Tangaye, Upper Volta, Africa. A total of 57 photovoltaic systems were designed, fabricated, and installed by GRC in locations in the United States and developing countries throughout the world.



Glenn also has considerable experience in developing large photovoltaic systems for spacecraft, including the ISS power system.

The STS-119 crew of space shuttle Discovery delivered and installed the International Space Station's final, major U.S. truss segment, Starboard 6 (S6), and its final pair of power-generating solar array wings.

General Information

NASA Glenn Research Center
www.nasa.gov/centers/glenn/home/

Glenn Test Facilities Guide
http://facilities.grc.nasa.gov/documents/facilities_Booklet_2005.pdf

Glenn Research Center Resume
www.nasa.gov/centers/glenn/about/

Business Development and Partnership
<http://newbusiness.grc.nasa.gov>



Glenn's solar thermal power concentrator focuses the Sun's energy onto high-temperature solar cells to produce electricity.

Business Development and Partnership Office

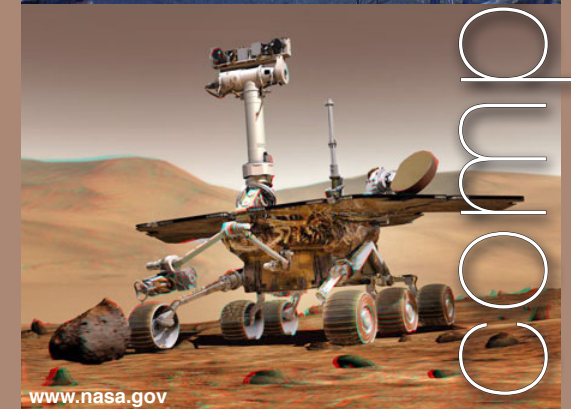
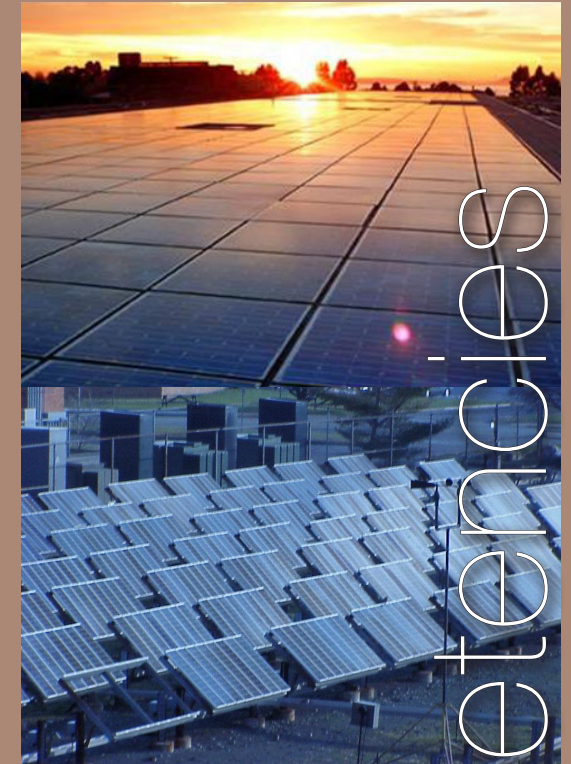
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Photovoltaics



www.nasa.gov

The objective of this competency is to develop high-efficiency solar cells and advanced photovoltaic (PV) array concepts applicable to a wide variety of uses and operating environments. Current development programs seek to improve the conversion efficiency, cost, specific power, reliability, and lifetime of devices compared to state-of-the-art PV technology.

NASA Glenn PV expertise ranges from solar cell development and fabrication to advanced array concepts. Specific capabilities include solar cell growth technologies and designs that incorporate nanotechnology to improve efficiency through optimal utilizations of the solar spectrum analysis of PV growth materials, evaluation of cell performance under solar concentration or extreme temperature conditions, and accurate performance measurement and calibration of PV devices.

Capabilities include

- Multiple organo-metallic chemical vapor deposition (OMCVD)
- Complete solar cell fabrication capabilities (contacts, metallization, etc.)
- Semiconductor material analysis
- X-25 continuous source and flash lamp measurements
- Learjet high-altitude cell calibration
- Terrestrial outdoor measurement test bed



Solar cell growth reactor

Electrical Systems

One objective of this competency is the innovative integration of diverse, state-of-the-art power devices in an optimal configuration for space and terrestrial applications. The appropriate application and control of the various power devices significantly improves overall system performance and efficiency. Advanced power devices include ultra-capacitors and photovoltaics, which have extremely wide potential with applications from nanowatts to megawatts. Applications include power generation, transportation systems, biotechnology systems, and space power systems.

Multidisciplinary Design and Optimization

The competency assesses program activities by calculating performance and economic benefits of advanced and unconventional technologies. These assessments help influence NASA's decision-making process and strategically guide the direction of its technology portfolios.

Nanotechnology

In the future, the use of nanomaterials will allow us to develop viable thin-film solar arrays and ultimately make these arrays out of lightweight, flexible, polymer-based materials.

Program Management

The ~100 project and program managers at Glenn have experience in managing 119 Centaur rocket launches, the Space Station Freedom power system, Ares launch vehicle systems, as well as numerous electric propulsion, communications, aeropropulsion, and microgravity projects.

Simulation and Modeling

- Design and modeling to identify systems as well as components.
- Virtual reality techniques to support the design of new technologies.
- Simulation of environments to provide testing for systems and components.

Structures and Materials and Coatings

This competency enables and extends durability of materials by understanding, developing and demonstrating the feasibility and viability of advanced material systems, and by developing performance models.

Structural Design

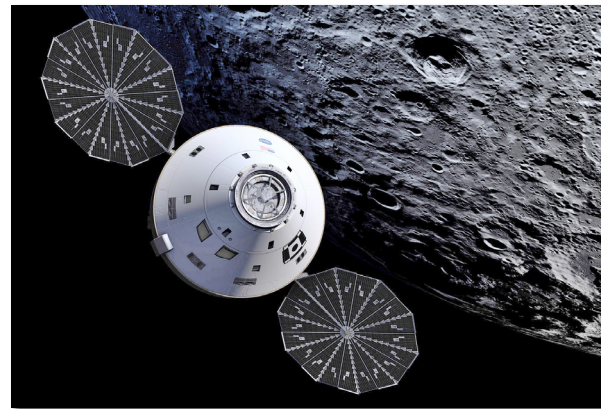
The goal of this competency is to study and model fluid-structures interactions and to predict and verify structural dynamic responses, loads, vibration, and shock environments for aerospace structures.

System Analysis and Engineering

This competency focuses on using tools to analyze aerospace vehicles, propulsion, and power concepts. It is focused on the development and maintenance of systems engineering processes and the application of engineering processes at a systems level.

Thermal Energy Conversion

Thermophotovoltaic (TPV) energy conversion systems generate electrical energy using PV cells that are able to make use of infrared radiation emitted from hot surfaces. TPV power conversion systems can utilize combustion, nuclear, or solar heat. Expertise includes use of rare Earth materials in emitters, use of high-temperature/low vapor pressure materials, computer modeling of optical and thermal properties of TPV systems, and performance measurement of system components.



Solar arrays provide power for the Orion capsule